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CHI LIANG CHO

2,987,910

SAFETY LOCKS

Filed July 23, 1957

2 Sheets-Sheet 1

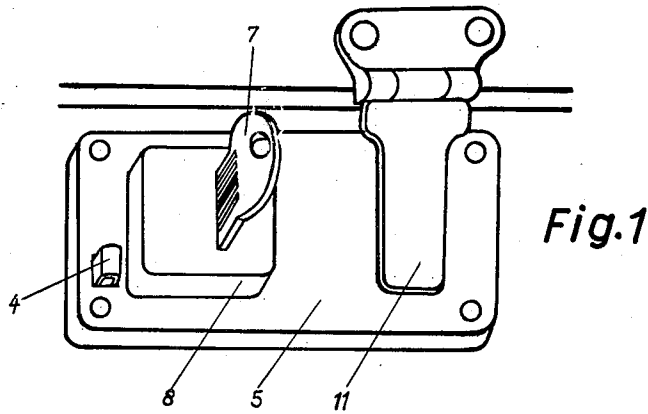


Fig. 1

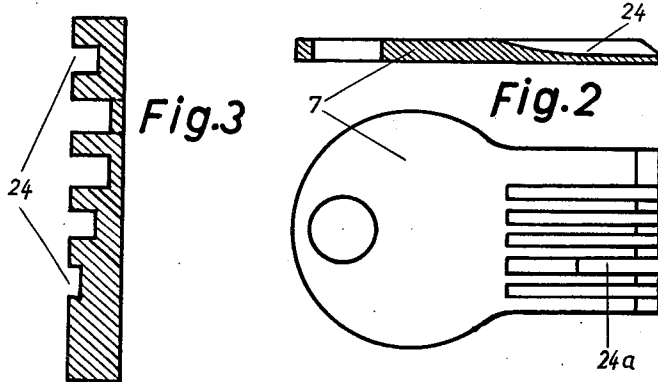


Fig. 3

Fig. 2

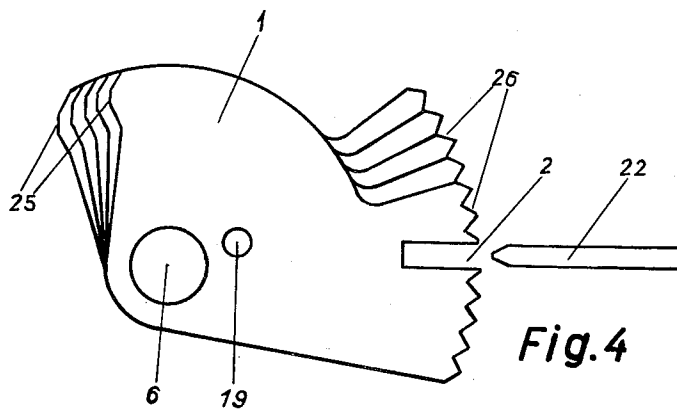


Fig. 4

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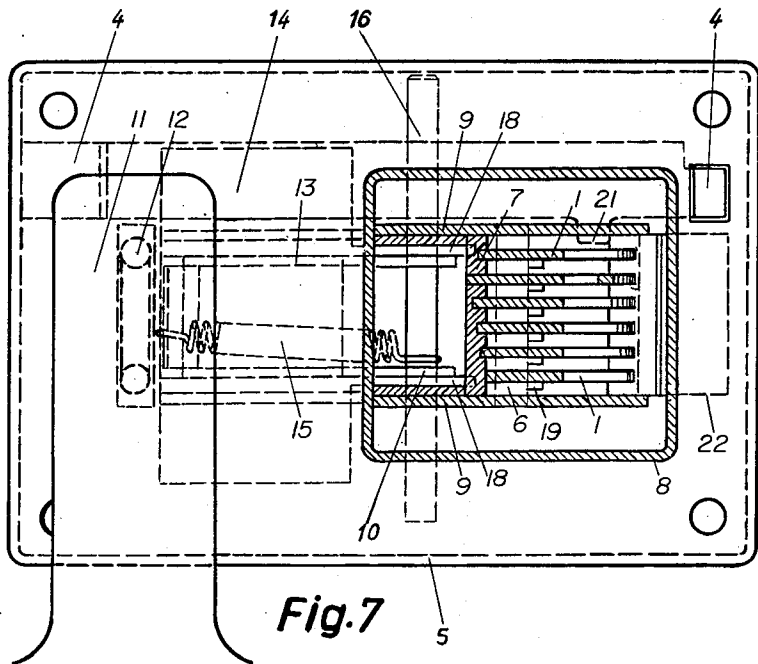
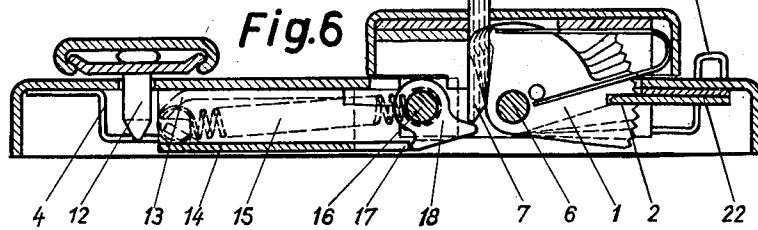
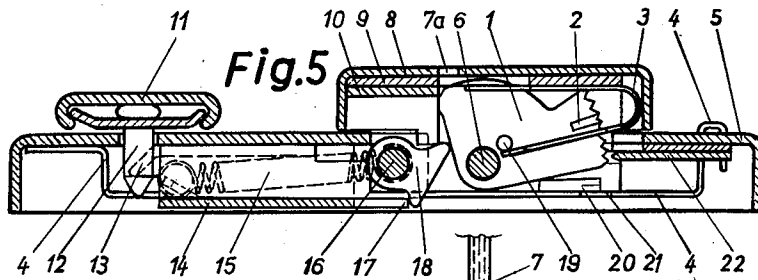
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2 Sheets-Sheet 2



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SAFETY LOCKS

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10 Claims. (Cl. 70-387)

The invention relates to a safety lock, and more particularly a push key lock operable by insertion of a key in the lock without turning key. As is known, previous safety locks have been provided with a cylindrical key body which is rotatably arranged in a lock body and is kept locked against rotary movement by means of a number of two-part pin tumblers. On inserting the wardless key, the locking action of the pin tumblers is annulled, so that the key body, which is provided with a ward, can carry out a rotary movement for the purpose of opening the lock. In the case of the above mentioned safety locks, the pin tumblers are arranged longitudinally of the lock body, i.e. in the direction of movement of the key, and, in accordance with the number of pin tumblers, they require a comparatively long path, for which reason they are also provided with a long lock body; consequently, the safety locks with a cylinder system are not suitable for all purposes, for example, in the case of thin-walled trunks, cupboards, safety compartments etc., to which, owing to lack of space, long lock bodies cannot be fitted. Especially is this the case with the service key for cash registers and the like in which, on depression of the keys, further direct controlling operations have to be performed in accordance with the safety-lock function.

In order to obviate the aforesaid defect, the novel safety lock (lightning opener) has been devised, the keys of which have a series of graduated longitudinal grooves which extend parallel to the direction of movement of the key and co-operate with a series of tumblers arranged transversely of the direction of movement of the key, in such a manner that, by inserting the key, the tumblers are pivoted out of the keyway and the key is enabled to proceed along the keyway to actuate locking or other controllable means extending into the keyway. It is impossible to obtain this simple operation with the safety locks hitherto known. The subject matter of the invention has another number of advantages as regards construction. Cylindrical lock bodies are dispensed with and the tumblers are made of single-piece flat elements in the form of stampings.

An embodiment of the subject matter of the invention is represented, by way of example, in the accompanying drawings as a safety lock for a trunk. For the sake of clearer representation, the figures are drawn on an enlarged scale.

In the drawing,

FIG. 1 is a perspective view of the trunk lock;

FIG. 2 shows the key;

FIG. 3 is a cross-section of the key, showing the grooves;

FIG. 4 shows the tumblers;

FIG. 5 is a longitudinal section of the lock in the locked condition;

FIG. 6 is a longitudinal section of the lock, showing the key inserted; and

FIG. 7 is a plan view of the lock with the lid removed.

As can be seen from the drawings, the lock is composed

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of the following principal parts, namely a flat key 7, a lid 8, which may be regarded as the lock body, a casing 5 and a top part 11, the latter two parts being fixed on the trunk. The flat key 7 is provided with a series of longitudinal grooves 24 and 24a which extend parallel to the direction of movement of the key. As shown in FIGS. 2 and 3, all such longitudinal grooves are provided in one of the two major surfaces of the flat key 7. The depths of the longitudinal grooves are graduated to produce different pivoting angles of the tumblers upon engagement of the tumbler cams 25 by grooves 24. In order to produce additional pivoting stages, continuous slotting may be effected in any one of the longitudinal grooves (for example 24a in FIG. 2). U-shaped frames 9 and 10 are located in the lid 8. The frame 9 extends over almost the whole lid and serves to guide the lid in a recess in the casing so that the lid may be displaced a few millimetres backwards and forwards as a lock body. The frame 10 extends only up to the keyhole 7a and serves as a guide for the key. The frame 9 serves the purpose of retaining the tumblers 1 and the lock bar 13. The parallel tumblers 1 are placed beneath the keyhole of the lid 8 and are arranged in succession transversely of the direction of movement of the key, i.e. in planes substantially perpendicular to the plane of the key. The tumblers 1 are rotatably mounted on the shaft 6 which is rigidly fixed to the frame 9. As shown in FIG. 4, each tumbler has a serrated extension 26 at one corner and a cam 25 at the opposite corner. A recess 2 is provided at the serrated end of the tumbler, the recesses of successive tumblers being offset in relation to each other by one serration so that insertion of detent bar 22 will hold the tumblers in the position shown in FIG. 4. The cams 25 of the tumblers 1 each have a bevelled edge and the end of the key is likewise bevelled in accordance with the shape of the cam 25 in order to facilitate the action of the key on the tumblers. Bent leaf spring 3 engages the tappets 19 of the tumblers and presses them resiliently against the side of the key. It can be seen in FIGS. 5, 6 and 7 that, on the right-hand side, a detent bar 22, which is fixed on the casing 5, is arranged opposite the tumblers and, on the left-hand side, a bar 13, which is suspended on the frame 9 by means of the shaft 16, is slidably guided in a frame-like guiding holder 14. The tension spring 15, which is mounted between a lug of the guiding holder 14 and shaft 16, serves the purpose of pulling the lid and the bar 13 towards the latch spring bow 12 of the upper part of the lock and to close it. Two levers 18 are located adjacent the two respective side walls of the bar 13 and are rotatably mounted on the axle 16. Each lever has two projections, one of which is directed towards the key whilst the other acts against the stop 17 which is rigidly fixed to the casing. The axle 16, which is rigidly mounted in the frame 9 of the lid 8, prevents the lid 8 from being lifted off the casing; the axle 6 can fulfill the same purpose.

The lock operates as follows: When the lock is in the closed condition, the cams 25 of the tumblers 1 will be in one plane (FIG. 5), whilst the grooves 2 in the tumblers will be offset in relation to one another and lie above the detent bar 22. The serrations of the tumblers 1 and the detent bar 22 interlock, so that the lid cannot be shifted to the right. In order to open the lock, the appropriate key 7 is inserted into the keyhole 7a and against the tumblers 1. Since the longitudinal grooves 24 or 24a of the tumblers are of graduated depth, engagement of tumbler

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cams 25 with the key grooves will fan out the tumblers so that the grooves 2 of all the tumblers lie in one plane (see FIG. 4 and FIG. 6). After the adjustment of the tumblers has been finished, the key continues in a straight line and its tip meets a projection on the lever 18, so that the lever 18 carries out a small rotation about the axle 16 and the other projection acts against the stop 17 of the guiding holder 14 in such a manner that the axle 16 together with the lid 8 and the bar 13 shift in the opposite direction, i.e. towards the right (FIG. 6) and the latch 13 releases the locked spring bow 12 of the upper part of the lock; consequently, the upper part of the lock will, in the usual known manner, by means of a torsion spring fitted on the hinge, be snapped upwards and the lock will consequently be opened.

Located within the casing 5 and laterally of the lid 8 is an operating bar 4 which consists of resilient material. Bar 4 has bent ends; one of which is fixed to casing 5, and is provided laterally with a catch 21. The other end has the form of a push-button and projects above the casing through an opening; it is urged upwards by spring action. The catch 21 co-operates with an edge 20 of a recess, at the bottom of the frame 9, in such a manner that the lid 8 and the latch 13 are locked against return halfway on their displacement to the right in order not to release the coupling between the tumblers 1 and the detent bar 22 until the operating bar 4 has been depressed and the catch 21 has been removed from the stop 20. The object of this arrangement is to make it possible to open and close the trunks, for example at home, without a key. By depressing the operating bar 4, the lid 8 and the bar 13 are pushed back completely and the lock is consequently closed.

Serrations 26 of the tumblers are in operative connection with the cut edge of the detent bar 22 in order to render it impossible to effect opening of the lock from the outside attempted through the keyhole.

What I claim is:

1. A safety lock comprising a lock body defining a keyway for guiding a key for longitudinal movement, a series of like tumblers disposed in parallel planes and pivotally mounted transversely of said keyway, a cam at one end of each tumbler, each of the like tumblers having a recess at its other end, the tumbler recesses lying in different planes when the tumblers are in superposed alignment, a flat key having a major surface and a plurality of graduated longitudinal grooves in said surface, said grooves parallel to the keyway and adapted to cooperate with the tumbler cams upon longitudinal movement of the key in the keyway, the plane of said key being perpendicular to the planes of said tumblers when the key is inserted into said keyway, the gradation of the key grooves corresponding to a pivotal movement of the tumblers out of the keyway to enable the key to continue its longitudinal movement and to align all tumbler recesses in a single plane, a detent bar mounted for engagement with the aligned tumbler recesses, means for closing the lock, and means for actuating the closing means from a closed to an open position, the latter means extending into the keyway beyond the tumbler cams and being actuatable by said key upon its continued longitudinal movement.

2. The safety lock of claim 1, wherein said tumblers are fan-shaped webs.

3. The safety lock of claim 1, wherein the other ends of the tumblers are serrated and the detent bar has an outer edge engageable by the tumbler serrations.

4. A safety lock comprising a lock casing, a lock body reciprocally mounted on said lock casing and defining a keyway for guiding a key for longitudinal movement therein, a series of like fan-shaped webs constituting tumblers pivotally mounted in parallel planes transversely of said keyway, a cam at one end of each tumbler, each of the fan-shaped tumblers having a transverse recess at its other end, the tumbler recesses lying in different planes

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when the tumblers are in superposed alignment, a flat key having a major surface and a plurality of graduated longitudinal grooves in said surface, said grooves parallel to the keyway and adapted to cooperate with the tumbler cams upon longitudinal movement of the key in the keyway, the plane of said key being perpendicular to the planes of said tumblers when the key is inserted into said keyway, the gradation of the key grooves corresponding to a pivotal movement of the tumblers out of the keyway to enable the key to continue its longitudinal movement and to align all tumbler recesses in a single plane, a detent bar mounted at one side of the keyway for engagement with the aligned tumbler recesses, an axle rigidly mounted in said lock body at the other side of the keyway and transversely thereof, a two-armed lever rotatably mounted on said axle, one of the lever arms extending into the keyway below the tumbler cams and engageable by the key upon its continued longitudinal movement in the keyway, a stop rigidly fixed to the lock casing and engaged by the other arm of the lever, a lock bar mounted in the lock body for reciprocal movement therewith, and a locking part engageable with and disengageable from the lock bar upon reciprocal movement thereof, engagement of the key with the one lever arm rotating the lever against the stop and reciprocating the lock body and bar to disengage the latter from the other locking part.

5. The safety lock of claim 4, wherein said axle is journaled in the lock casing to prevent the lock body from being lifted off the casing.

6. The safety lock of claim 1, comprising a bent leaf spring and stop means on said tumblers engaged by said leaf spring, the leaf spring being biased to press the tumblers resiliently toward the keyway.

7. The safety lock of claim 4, comprising a spring-actuated operating lever, and catch means on said lever for locking the lock body in a position on said lock casing wherein the detent bar engages the tumblers, the catch means releasing the lock body upon depression of the spring-actuated operating lever.

8. A safety lock comprising lock body means defining a keyway for guiding longitudinal movement of an elongated key; a plurality of tumbler means, each having a cam portion in said keyway and a locking portion, said tumbler means being pivotable in said body means in respective substantially parallel longitudinal planes toward and away from respective unlocking positions, said cam portions moving transversely of the direction of movement of said key when the respective tumbler means pivot; a detent member in said body means lockingly engaged in a fixed position by said locking portions when said tumbler means are away from said unlocking positions thereof, and released by said locking portions for movement in said body means away from said fixed position when said tumbler means are in the unlocking position; an elongated key insertable in said keyway and guidedly movable therein, said key having a longitudinal face formed with a plurality of grooves, each groove having a flat bottom face extending longitudinally at a constant respective depth under said key face and being engageable with a respective one of said cam portions during insertion of said key for pivoting the respective tumbler means into the unlocking position thereof and for holding the same in said position during longitudinal movement of said key; and resilient means permanently urging said tumbler means to move away from said unlocking position in a direction of abutting engagement of said cam portions thereof with said bottom faces.

9. A safety lock as set forth in claim 8, further comprising a movable member fixedly secured by said detent member when the same is in the fixed position thereof, and free to move when said detent member is away from said fixed position; and an actuating member in said keyway and abuttingly engaged by said key during said longitudinal movement thereof for actuating movement of said movable member.

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10. A safety lock as set forth in claim 8, wherein said bottom faces of said grooves are at different depths under said key face.

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